NIST/Industry Polymer Surface/Interface Workshop
NIST, Gaithersburg, MD
PSI Workshop Oct 17, 2018, *Conference Room:* West Square/Bldg. 101

8:00 – 8:15	**Registration/sign in**
8:15 – 8:30	**Welcome and overview**
8:30 – 8:45	**Opening remarks**: Jason Averill, MSSD Division Chief
8:45 – 9:00	**Service-life Prediction & PSI consortium at PMG/NIST** Lipiin Sung, PMG/EL
9:00 – 9:30	**Challenges in Interior Automotive Component Manufacturing** Dr. Rose Ryntz – IAC
9:30 – 10:00	**Tools, Methods, Approaches: Nanostructure and Deformation Behavior of High Performance Fibers** Dr. Ken Strawhecker, ARL
10:00 – 10:15	*Break*
10:15 – 10:45	**Studies of Coating Stress as a Function of Exposure** Dr. Jennifer David, Momentive
10:45 – 12:30	**Short Presentations from Participants (including PSI members) – company focus and research needs (**10-12 min/company)

- ***Saint-Gobain Research North America***
  - Dr. Olivier Rosseler (Saint-Gobain Research North America)
- ***How to study filler-binder synergy for elastomeric materials during degradation?***
  - Drs. Yuming Lai and Maryus Chyasnavichyus (Dow Chemical)
- ***BASF***
  - Dr. Joe Fay
- ***The usefulness of weathering reference materials. What they are, how they can be used, how not to use them***
  - Matt McGreer (Atlas Material Testing Technology)
- ***Water delivery for improved accelerated testing (ASTM D7869) and expanding this concept into tests designed for other classes of materials***
  - Dr. Andy Francis, Q-Lab Corporation
- ***Eyelighting's involvement with the ASTM MH (metal halide) standard***
  - Doug Vermillion, Eyelighting
- ***Annual outdoor solar spectral energy distributions from spectroradiometer data***
  - Dr. James E. Pickett

12:30 – 1:20p Lunch (NIST Cafeteria)

1:20 – 1:35p ***n*-Soft and neutron research @NIST**

Dr. Ron Jones, MML

1:35 – 2:30p **Recent developments & accomplishment of PSI (4 talks)**

NIST & PSI members – 12-15 min each

- ***PSI recent accomplishment***
  - Dr. Lipiin Sung/NIST
- ***Fundamentals and characterizations of scratch resistance on automotive clearcoats*** (Eastman/Anton Paar/NIST)
  - Dr. Andrew Detwiler (Eastman)
- ***Weathering of polypropylene*** (Saint-Gobain/NIST)
  - Dr. Olivier Rosseler (Saint-Gobain Research North America)
- ***Reciprocity and activation energies—NIST Round 2*** (SABIC/ NIST)
  - Dr. James E. Pickett/Olga Kuvshinnikova, SABIC, Selkirk, NY

2:30 – 3:10 **Panel Discussion I**: Challenges in Weathering Testing and Prediction

- test method, correlation between different testing
- light source, different spectrum
- standards materials for weathering

3:10 – 3:25 *Break*

3:25 – 4:10 **Panel Discussion II:** Research needs on surface/interface characterization -tool, test methods, modeling

4:10-4:30 Wrap up discussion – future of PSI

4:30 **Lab tour**

6:30 **Dinner at local restaurant**

NIST/Industry Polymer Surface/Interface Workshop
October 17, 2018, NIST, Gaithersburg, MD
Abstract and bio

Challenges in Interior Automotive Component Manufacturing

Rose A. Ryntz, Ph.D.
IAC, 800 Chicago Road, Troy, MI 48083
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Abstract:

Interior Automotive requirements continue to evolve as the USA CAFÉ standards drive weight reduction and enhanced powertrains in efforts to achieve 54.4 mpg by 2025. With ride sharing increasing and with an eye on the autonomous vehicle, material selection, connectivity, and interior craftsmanship become important criteria for manufacturers. This talk will discuss the changing landscape in automotive interiors and address the advances being made in light weighting, durable and non-petroleum based materials, and processes utilized to make new constructions.

Bio:

Dr. Ryntz obtained a Ph.D. degree in polymer/organic chemistry from the University of Detroit and a MBA from Michigan State University. She was employed at various companies (Dow Chemical, DuPont, Ford Motor, Akzo Nobel, and Visteon) prior to her current role as Vice President of Global Advanced Development and Material Engineering at International Automotive Components, IAC Group North America.

She has been a prolific lecturer both domestically and internationally, being an invited lecturer at many symposia. Dr. Ryntz has published extensively, with over 180 publications, 36 patents, and four books.

Dr. Ryntz has been the recipient of many prestigious awards. Most recently she was honored with the Society of Plastic Engineers (SPE) - Detroit Section Lifetime Achievement Award, was named One of the Automotive News 100 Leading Women in Automotive in 2015, was named as one of the SPE Detroit Section Emeritus Founding Members of the TPO Automotive Conference in 2014, and was the recipient of the esteemed 2013-2014 SPE Detroit Section Outstanding Member Award. Additionally, she was the recipient of the International Biographical Center Who's Who in the World, Best Paper and Best Speaker awards through the Federation of Societies for Coatings Technology (FSCT) and Society of Plastic Engineers, the FSCT Women in Coatings Management Achievement Award , the George B. Heckel Award and Matiello Award presented by the FSCT, the American

Chemical Society (ACS) Roy Tess Award, the Women Automotive Association International Professional Achievement Award, the Outstanding Leadership Award sponsored by the Engineering Society of Detroit (ESD), the Elias Singer Best Paper Award sponsored by the University of Southern Mississippi, the Gold Award sponsored by the ESD, a Roon Award sponsored by the FSCT, and the Henry Ford Technology award presented by the Ford Motor Company for outstanding technical contributions to the Company.

Dr. Ryntz served as President of the FSCT from 2005 – 2007 and was elected as a Fellow to the Society of Plastics Engineers in 2006. She serves on the Board of Advisors in the College of Engineering at University of Detroit, and has served on the Detroit Section of the SPE Board of Directors as well as the NIST Board of Technology Assessment for the Building and Fire Research Laboratories.

Tools, Methods, Approaches: Nanostructure and Deformation Behavior of High Performance Fibers

Dr. Kenneth Strawhecker, Materials Engineer, Composites and Hybrid Materials Branch, Weapons and Materials Research Directorate

Abstract:

The Army desires to reduce Warfighter burden through increased protective packages. To do so, ballistic fiber processing can be varied to achieve better performance. Sub-fiber structural information is key to tweaking the processing. ARL has developed unique techniques to make these fiber morphology measurements and therefore feedback directly to fiber manufacturers. The measurements can be made from the micron to the molecular scale and these results have recently been published for Aramids and UHMWPE. We are currently working with industrial partners such as DuPont and Honeywell through Joint Work Statements and Test Services Agreements to directly feedback to their processing of Next Gen fibers which Army partners look forward to using in their Next Gen lightweight armor packages.

Bio:

Dr. Strawhecker is a Materials engineer ARL-WMRD's Composite and Hybrid Materials Branch and leads the Multiscale Behavior of Fibers and Textiles portion of the Soldier Materials/Soft Armor Program. His research interests include processing-structure-property-performance relationships for a variety of materials, especially high-performance fibers. Dr. Strawhecker has co-authored over 35 journal publications and book chapters and contributed to more than 35 conference proceedings. Many of his recent works highlight novel sample preparation and probing techniques which he developed and which are sought

by industrial and academic researchers in fiber science towards developing next generation anti-ballistic fibers.

Studies of Coating Stress as a Function of Exposure

Dr. Jennifer David, Momentive Performance Materials, Inc.

Abstract:
Coatings used in exterior automotive applications are subjected to cycles of temperature and humidity throughout their lifetimes. These environmental factors generate stresses in the coating in cases where there is mismatch between the properties of the coating compared with its substrate. Additionally, exterior coatings are exposed to UV radiation. If this exposure alters the coating properties through reaction or degradation processes, the coating's response to external stress is also likely to change. The measurement of stress is challenging for coatings of only 5-12 micron thickness, particularly if these measurements must be collected as a function of exposure. However, such knowledge of a coating is critical in the prediction of cracking failures. This talk will present examples of how such measurements can be performed through study of a single layer primerless hardcoat system.

Bio:

Jennifer David did her undergraduate work in the Materials Science department at the University of Illinois at Urbana-Champaign and holds a PhD in Polymer Science and Engineering from the University of Massachusetts, Amherst. She has worked at Momentive for nearly 20 years and is currently a Senior Scientist in the Coatings Technology division, where she supports the global product team by developing characterization methods and investigating structure-property relationships of automotive hardcoats.

Morning Short Presentations from Participants (including PSI members) – company focus and research needs (10-12 min/company)
Presentation order (TBD)

1. **Title: Saint-Gobain Research North America**
   Olivier Rosseler (Saint-Gobain Research North America)
   Abstract: Saint-Gobain Research North America is one of the 8 transversal R&D Center for Saint-Gobain, serving our businesses in the Innovative Materials and Construction Products sectors. Saint-Gobain's growth is driven by innovation and durability testing supports that innovation, to successfully introduce new solutions in

markets as varied as construction products, polymer materials, ceramic materials and abrasives.

2. **Title: How to study filler-binder synergy for elastomeric materials during degradation?**

Yuming Lai and Maryus Chyasnavichyus (Dow Chemical)

Abstract:

Many elastomeric materials are highly filled for the perspectives to boost mechanical properties, to meet processing needs, or more importantly to reduce overall product cost. This system is often complex, thus, it is very challenging to characterize and effectively interpret the data by typical analytical approaches. For highly filled elastomeric materials, one question of our interest is "how to study filler-binder synergy during degradation". Understanding this will help differentiate the failure root causes, either from failure occurred in binder itself or binder-filler synergy, and help develop appropriate strategies for more durable products.

3. **Title: BASF**

Joe Fay

Bio: Dr. Joe Fay currently works for BASF Corporation in the Applications Laboratory within the Plastic Additives Business Unit and is based in Tarrytown, NY. His current responsibilities include customer-focused technical service and applications development for BASF's plastic additives product range including antioxidants, processing stabilizers, light stabilizers and other specialty additives. His current focus area is in developing stabilizer enhanced compounds for building and construction applications.

Joe has over 25 years of experience in the plastics industry having begun his professional career with Ciba-Geigy's Plastic Additives group in Ardsley, NY. After several years in NY, Joe transferred to Ciba's Pigments Division in Newport, DE where he was technical and laboratory manager for pigments in plastics applications. Upon returning to NY and the Additives Division, he held staff positions in marketing and product management before eventually returning to the applications labs as a staff scientist. He was appointed a Technical Fellow in 2006 in recognition of his significant contributions to the technology and commercial application of polymer stabilizers.

Joe obtained his Ph.D. and M.S. degrees in Polymer Science and Engineering from Lehigh University and his B.A. in Chemistry from East Stroudsburg University.

4. **Title: Annual outdoor solar spectral energy distributions from spectroradiometer data**

James E. Pickett, Consultant, Schenectady, NY
Patrick J. Neale, Smithsonian Environmental Research Center, Edgewater, MD
Jacob P. Pickett, Worcester Polytechnic Institute, Worcester, MA

Abstract:

Although spectral power distributions (SPD) of sunlight are available or can be calculated, the actual annual spectral energy distributions (SED) are not. The SED is the energy received at each wavelength over the course of a year. The variability of the SED also is not known. A Smithsonian/NIST collaboration placed UV spectroradiometers in Miami, FL, Phoenix, AZ, and Madison, WI during the period 1997-2012 collecting data at ~ 2 nm intervals between 290 and 324 nm. The data are not complete for any year, but gaps could be patched using data from other years. This dataset could be compared to data available on-line from an ongoing USDA/Colorado State University after similar patching. The USDA data have fewer points in the UV but extends into the visible portion of the spectrum. The data sets give consistent results and show that the SEDs in Miami and Phoenix can be fit using SPDs calculated using SMARTS 2.9.5 for air mass 1.2. The annual standard deviation is 4-5% for wavelengths > 300 nm.

5. **Title: The usefulness of weathering reference materials. What they are, how they can be used, how not to use them**

Matthew McGreer – *Sr. Product Manager, Weathering Instruments*
Atlas Material Testing Technology LLC
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Bio:

Mathew McGreer has been involved with weathering or the degradation of materials for nearly 30 years. Nine of those years were spent at DSET Laboratories in Phoenix, Arizona where Mr. McGreer was the Manager of Evaluation Services. As the General Manager of Client Education for Atlas, he coordinated several courses related to material degradation, and authored the "Weathering Testing Guidebook," an introductory book on weathering theory and test applications. After five years as Atlas' Quality Director, Matt accepted and currently holds the position of Sr. Product Manager for Atlas weathering instruments. He is also responsible for Atlas' standards participation with ASTM, ISO, and a number of other industry-specific standards organizations.

Mr. McGreer received a Bachelor of Science degree from the University of Nebraska, and a Master of Business Administration degree from DeVry University.

6. **Title: Water delivery for improved accelerated testing (ASTM D7869) and expanding this concept into tests designed for other classes of materials**

Dr. Andy Francis, Q-Lab Corporation

Abstract: Service life prediction and other correlative testing for plastics and polymeric materials is facilitated by test protocols that offer more realistic accelerated conditions than historical test standards. Althoguh irradiance and temperature have long been calibrated and measured carefully, water delivery in accelerated weathering has not. The ASTM D7869 test for transportation included the first calibration of water delivery, and a new proposal in the ISO plastics committee would similarly quantify water delivery. This short presentation will cover the topic of water delivery for improved accelerated testing and expanding this concept into tests designed for other classes of materials.

Bio: Dr. Andy Francis is Weathering and Corrosion Projects Manager at Q-Lab. Andy joined Q-Lab in 2015 and has a dual focus on new product development across all of Q-Lab's product lines as well as external communication with Q-Lab's representatives, customers, and the scientific community.

Andy has over 10 years of experience in R&D for new products and applications in diverse fields including weathering and corrosion, synthetic graphite, commercial lighting, polymers, steel, and thin film coatings. Prior to joining Q-Lab, Andy worked for General Electric and as a Senior Research Scientist at GrafTech International.

Andy received both his BS and Ph.D in Materials Science and Engineering from Carnegie Mellon University.

7. **Title: Eyelighting's involvement with the ASTM MH (metal halide) standard**

Doug Vermillion, Director

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Recent developments & accomplishment of PSI (4-5 talks)
NIST & PSI members – 12-15 min each

1. **Fundamentals and characterizations of scratch resistance on automotive clearcoats Eastman/Anton paar/NIST** -*Progress in Organic coatings 125 (2018) 339-347*

   Dr. Andrew Detwiler, Eastman

2. **Weathering of polypropylene (Saint Gobain/NIST)**
   Olivier Rosseler (Saint-Gobain Research North America)

   Abstract: Standard weathering tests for polymeric materials are not material specific. The same test will accelerate the degradation of different polymers at different rates, depending on their sensitivity to the weathering stress factors. In this work, we are using the NIST SPHERE to vary the intensity of stress factors to measure the degradation rate of polypropylene as a function of UV irradiance, temperature and moisture.

3. **Reciprocity and activation energies—NIST Round 2 (SABIC/NIST)**

   James E. Pickett and Olga Kuvshinnikova, SABIC, Selkirk, NY
   Li-Piin Sung, NIST

   Abstract: We need to know the effects of accelerating factors on materials in order to properly design and interpret accelerated weathering effects. Among the key factors are the higher intensity of UV radiation (reciprocity), temperature effects (activation energy), moisture effects, and UV wavelength effects. These factors were examined for polycarbonate, poly(butylene terephthalate), a PC/PBT blend, and poly(styrene-co-acrylonitrile) in Round 1 of this study using the NIST SPHERE to do carefully controlled exposures. These color shift and gloss loss of materials were "well behaved"—good reciprocity, moderate activation energies, and little effect of humidity. This round includes two transparent PC copolymers, white resorcinol polyarylate (RPA), and white ABS. The reciprocity and temperature effect experiments have been completed, and the results are discussed. RPA exhibits a small negative activation energy. ABS yellowing exhibits non-reciprocity and a high activation energy while ABS gloss loss exhibits reciprocity and a moderate activation energy indicating that different processes drive the two degradation modes.